

# Supplementary Figures

## **Accumulation of aerosols over the Indo-Gangetic plains and southern slopes of the Himalayas: distribution, properties and radiative effects during the 2009 pre-monsoon Season**

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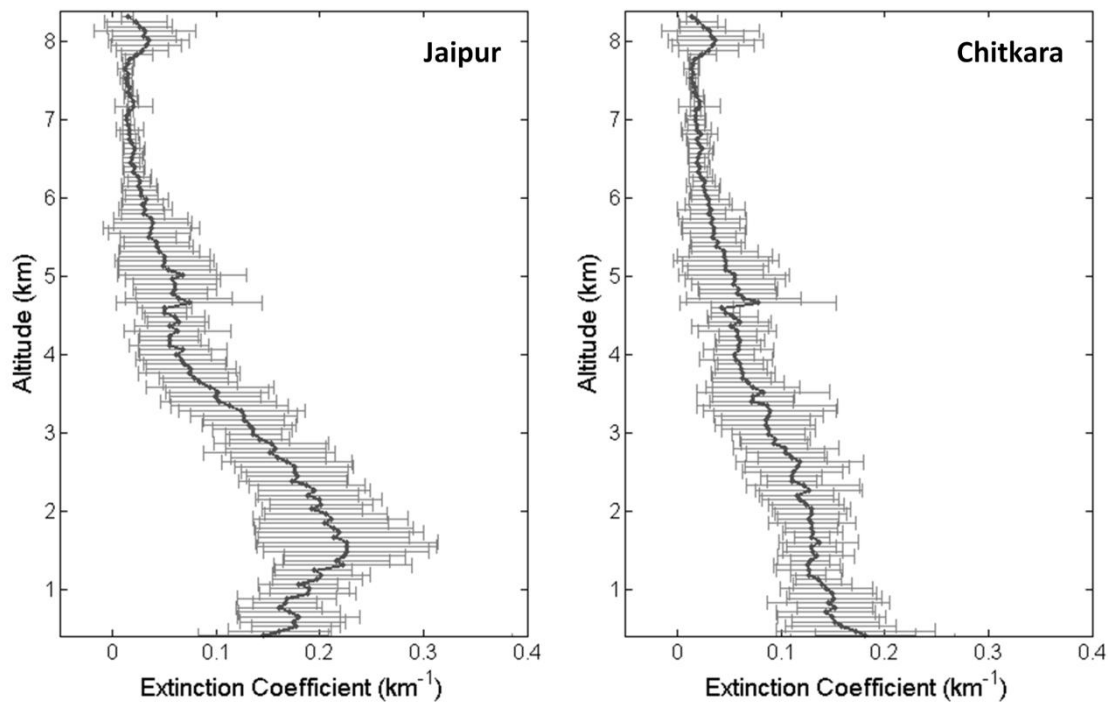
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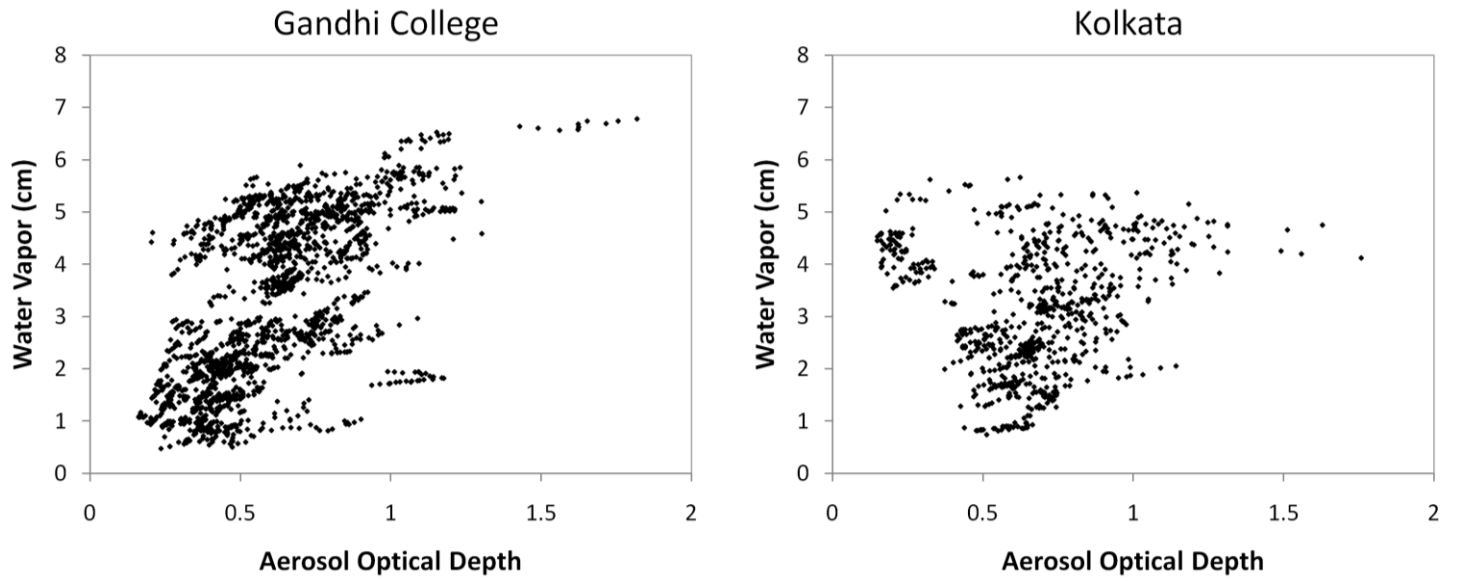
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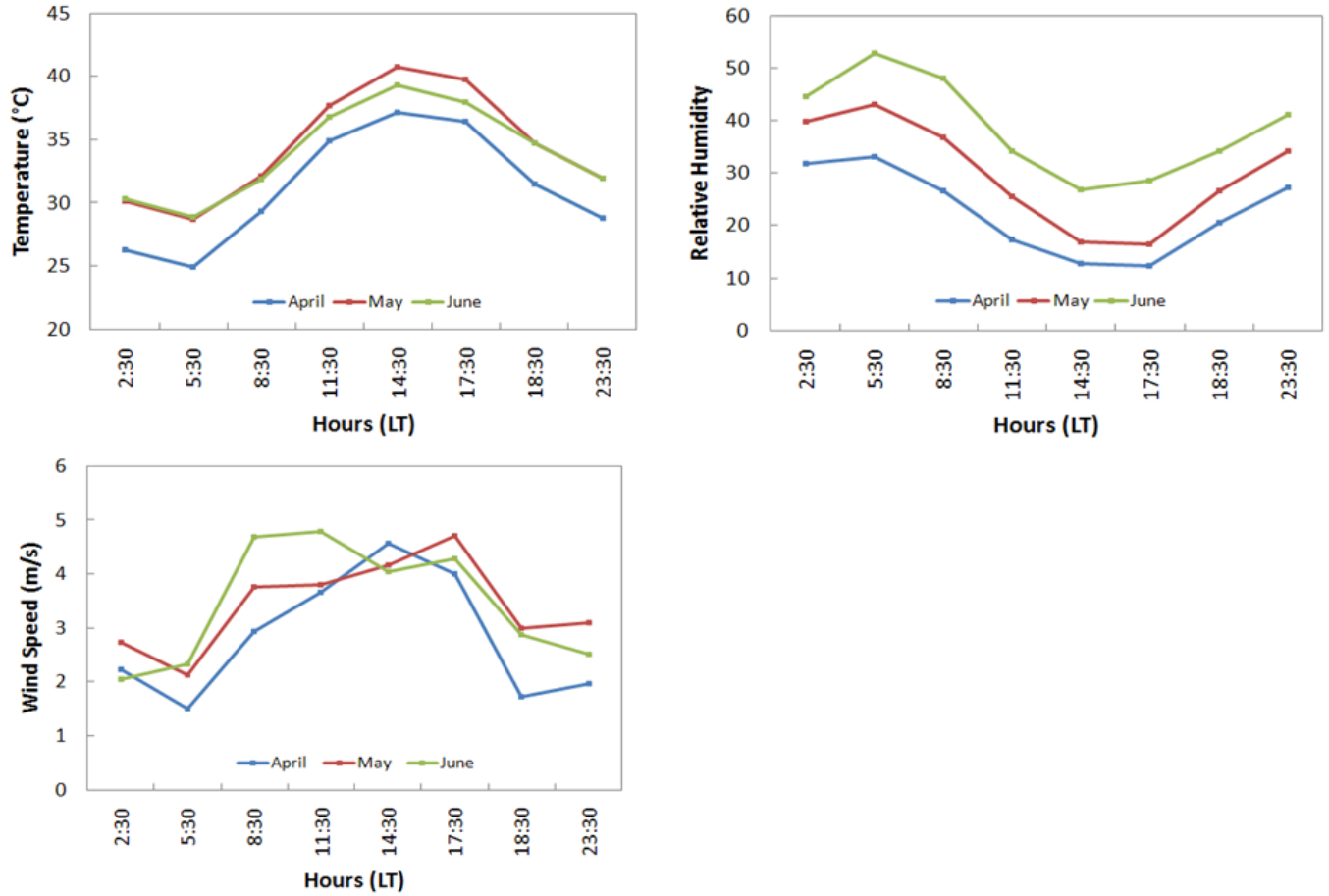
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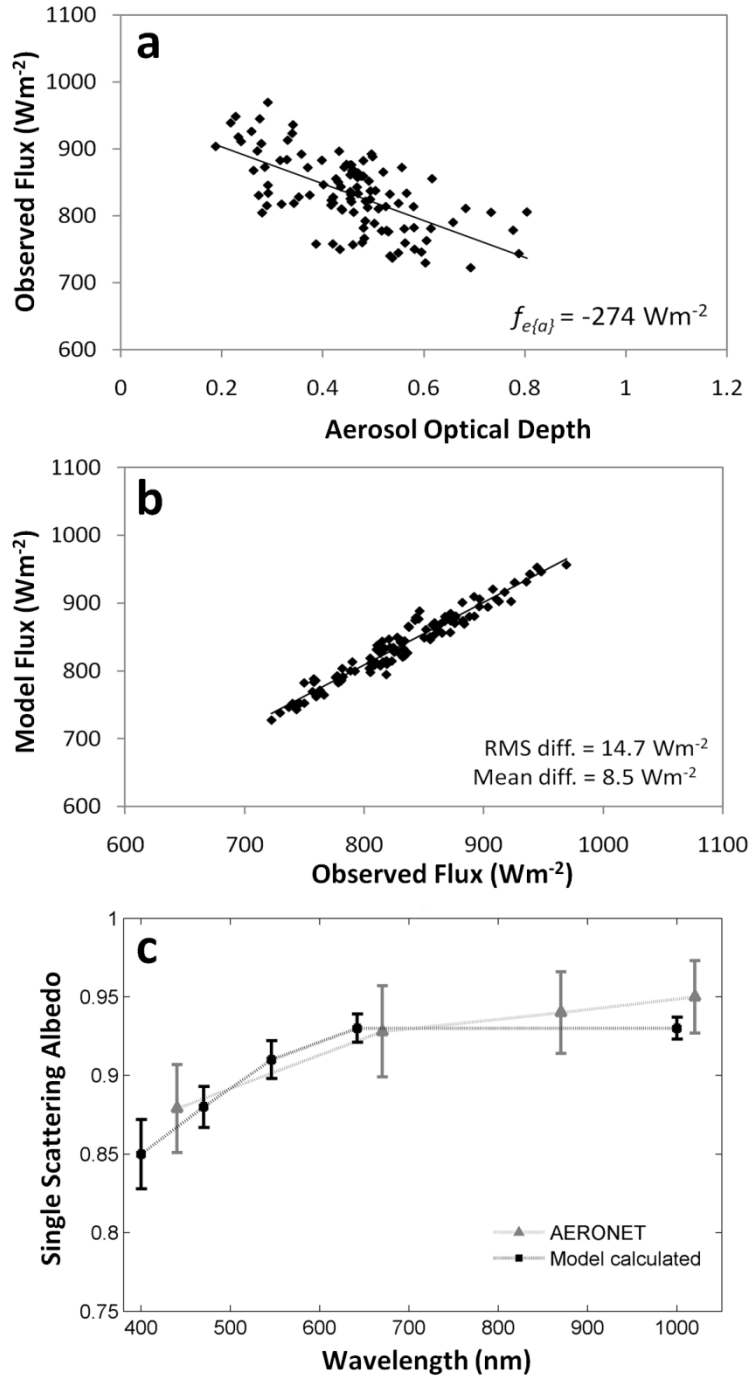
**Fig. S1** Vertical distribution of aerosols shown by the spaceborne CALIPSO aerosol extinction profile for the period March 15-June 15, 2007-2010 averaged over a 2°x2° box centered over Jaipur (left) and Chitkara (right).



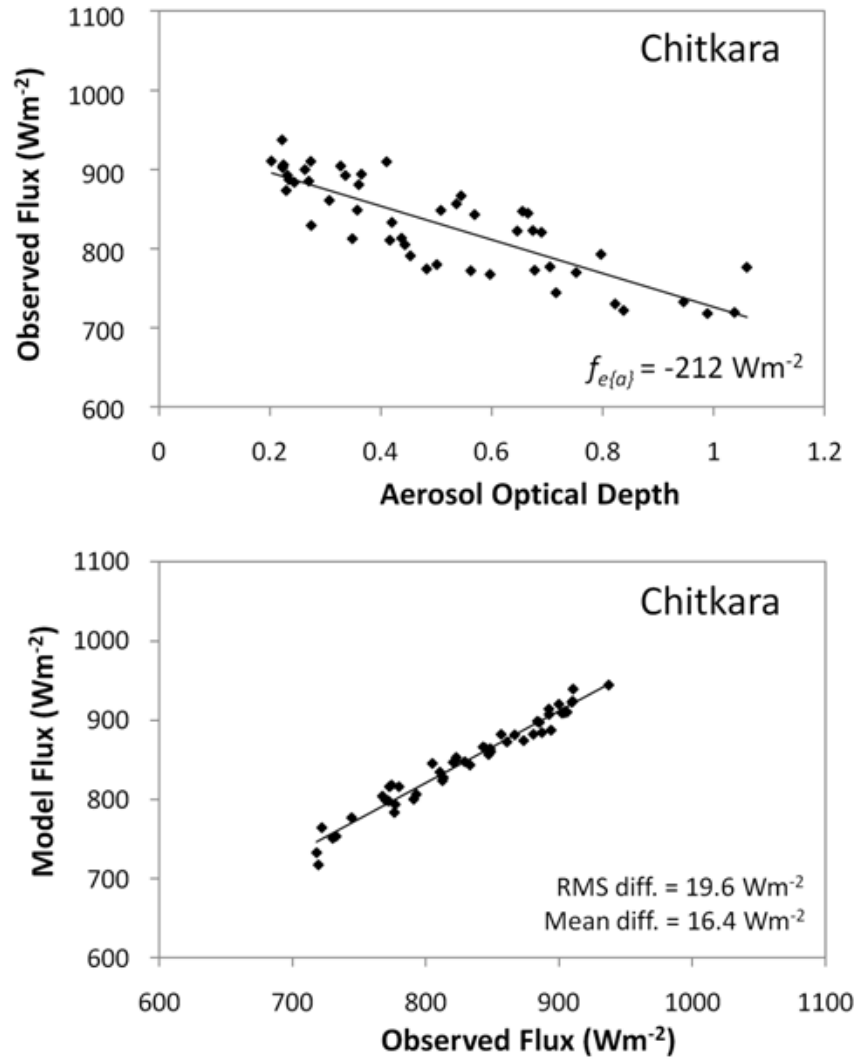
**Fig. S2** A weak association is observed between AOD and WV over the eastern IGP as indicated by the data from AERONET stations at Gandhi College and Kolkata.



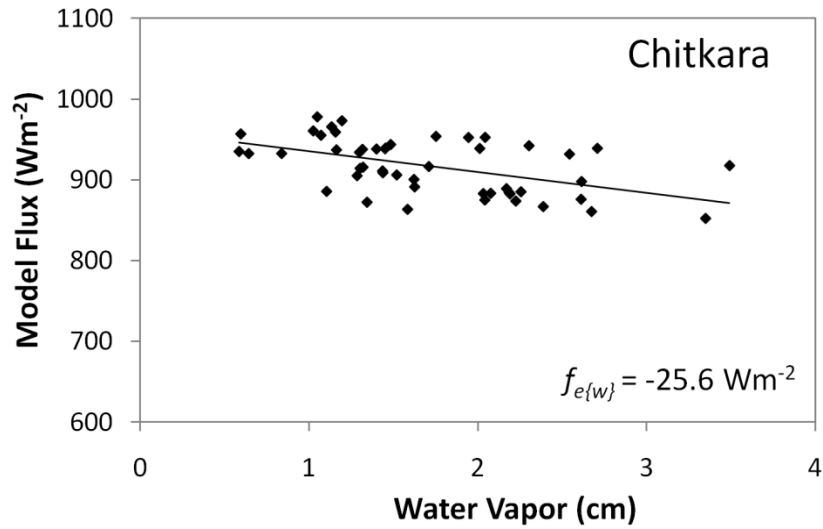
**Fig. S3** Hourly mean variations of Temperature, Relative Humidity and wind speed recorded near the Jaipur measurement site for April, May and June. Three-hour intervals of data are shown from 2:30 to 23:30 corresponding to local time at Jaipur. Relative Humidity for all months during pre-monsoon period is less than 50% over Jaipur.



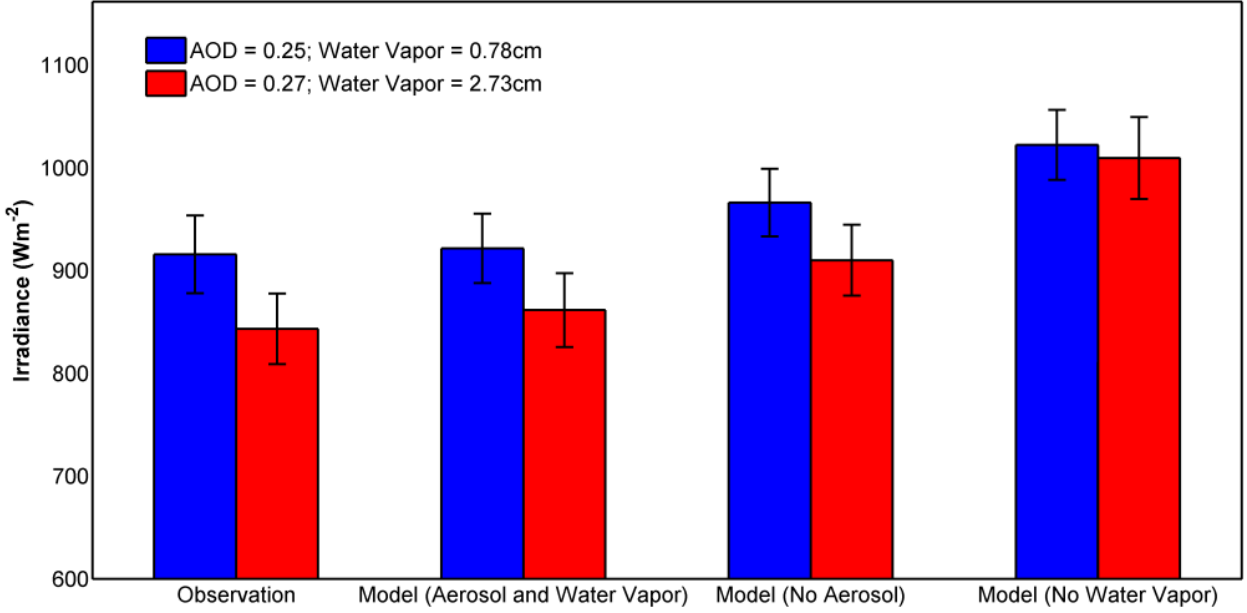
**Fig. S4** (a) instantaneous aerosol radiative forcing efficiency over Jaipur from surface solar flux measurements co-located with sunphotometer for the  $25^\circ$ - $35^\circ$  solar zenith angle interval; (b) comparison of observed and model simulated surface fluxes for Jaipur; and (c) single scattering albedo calculated from model (black circles) and obtained from AERONET (grey triangles) over Jaipur for the 2009 pre-monsoon measurement period.



**Fig. S5** Aerosol forcing efficiency ( $f_{e(a)}$ ) at surface from instantaneous pyranometer solar flux measurements collocated with the sunphotometer at Chitkara (top panel) for the 25°-35° solar zenith angle interval during pre-monsoon season of 2009; (bottom panel) comparison of observed and model simulated surface flux with rms and mean difference values shown in bottom panel for Chitkara.



**Fig. S6** Modeled flux as a function of instantaneous water vapor retrievals from sunphotometer, with no aerosol input (AOD=0), for Chitkara for the  $25^{\circ}$ - $35^{\circ}$  solar zenith angle interval during pre-monsoon season of 2009. The forcing efficiency ( $f_{e\{w\}}$ ) due to water path abundance is estimated to be  $-25.6 Wm^{-2}$ , respectively.



**Fig. S7** Irradiance (downward shortwave flux) plotted for two groups: low AOD and low water vapor group (blue bars), and low AOD and higher water vapor (red bars). Fluxes are obtained from observations and model calculations for three cases namely, combined aerosol and water vapor, water vapor only (no aerosol) and aerosol only (no water vapor).